REMARKS

By the amendment claims 15-20 and 36-40 are canceled without prejudice.

Claims 36-40 were non-elected claims in a reply to the requirement for restriction and are now canceled without prejudice to Applicant's filing of a divisional application before termination of proceedings in this application.

There was an rejection of claim 21 under 35 U.S.C. §112, second paragraph, based on the use of the word "outward" and "outwards" in claim 21. This has been corrected by an amendment reciting that "said pipe (is) provided around an outside of said plurality of pipes, while said pipe allowing the carrier gas under pressurization to flow thereinside and on the outside of each of said plurality of pipes."

With respect to the rejection of claim 21 and claims dependent thereon, the Applicant would hereby submit the following remarks in comparing the present invention with the references cited by the Examiner.

The amended description "a dispersing portion provided between the leading ends of said plurality of pipes for the plurality of raw-material solutions and said orifice, said dispersing portion mixing the plurality of raw-material solutions with the carrier gas" in claim 21 is based on the description "A dispersing portion 14 is formed in between the respective leading ends of the first and second pipes 1, 2 in the inside of the pipe 3 and the orifice" in paragraph 0077 in the present specification, and the description "The dispersing portion 14 mixes the first raw-material solution, the second raw-material solution and the carrier gas" in paragraph 0080 in the present specification. Further, the amended description "the plurality of raw-material solutions and the carrier gas mixed one another at said dispersing portion is sprayed into said vaporizing tube at a fast speed" is based on the descriptions "The pressure of the inside of the vaporizing portion 13 is, for instance, 5 – 30 Torr, while that of the inside of the dispersing portion 14 is, for instance, 1500 – 2200 Torr. By setting the pressure-difference like this, the carrier gas is ejected toward the vaporizing tube 13 at ultrahigh-speed," in paragraph 0082 in the

present specification.

(2) As is apparent from FIG. 1B, the carrier gas pipe is disposed outwardly of a raw-material solution pipe in such a manner as to cover a raw-material solution path. Accordingly, the word "outward" in claims 21 to 35 simply means the outside of a raw-material solution path. Thus, the word "outward" is changed to a word "outside" by amendment. It is strongly believed that claims 21 to 35 are clarified by amendment.

(3) As is apparent from the description in claim 21, the present invention is characterized in that a carrier gas supplied from a carrier gas pipe disposed in such a manner as to cover the outside of a raw-material solution path uniformly flows to the vaporizing tube through the orifice, is mixed with the raw-material solutions at the dispersing portion provided between the orifice and the leading end of a raw-material solution pipe, and is immediately ejected from the orifice to the vaporizing tube at a high speed.

In contrast, as is apparent from the descriptions "The dispersing section 8 comprises a gas passage 2 formed in the interior of a dispersing section body 1 constituting the dispersing section 8, a gas introduction port 4 for introducing a carrier gas 3 under pressure into the gas passage 2, means (a raw material feed opening) 6 for feeding a raw material solution 5 to the carrier gas 3 passing through the gas passage 2, a gas outlet 7 for delivering the carrier gas 3 containing the dispersed raw material solution 5 to the vaporizing section 22, and means (cooling water) 18 for cooling the carrier gas 3 flowing through the gas passage 2. The vaporizing section 22 comprises a vaporizing tube 20 having one end connected to a reaction tube of the MOCVD system and having the other end connected to the gas outlet 7 of the dispersing section 8, and heating means (a heater) 21 for heating the vaporizing tube 20. The vaporizing section 22 serves to heat and vaporize the dispersed raw material solution containing carrier gas 3 delivered from the dispersing section 8." In column four, line 15 to line 33 of Toda, Toda discloses a dispersing portion, a vaporizing tube, and a heating means which heats the

vaporizing tube. However, Toda does not disclose or suggest a characteristic of the invention set forth in claim 21 that "the carrier gas pipe is disposed outwardly of the raw-material solution pipes as to cover the raw-material solution pipes".

As is apparent from the descriptions of Toda "a 4.50 mm dia. bore (cylindrical hollow portion) is formed in the interior of the dispersing section body 1. A rod 10 is centered in the bore, the rod 10 having an outer diameter (4.48 mm) smaller than the inner diameter of the bore. The gas passage 2 is formed by a space defined between the dispersing section body 1 and the rod 10." In column four, lines 37 to 43, Toda has "a dispersing portion which disperses a raw-material solution into a carrier gas at an annular gas passage formed by a space between the dispersing section body and a rod".

As is apparent from the descriptions of Toda "The width of the gas passage 2 is preferably 0.005 to 0.10 mm. The width less than 0.005 mm may render the machining difficult. The width exceeding 0.10 mm may necessitate use of a high-pressure carrier gas in order to increase the velocity of the carrier gas." (column 4, lines 45 to 49) To set the area of the gas passage to 0.10 to 0.5 mm^2, it is necessary that the space between the dispersing section body 1 and the rod 10 should be less than or equal to 8μ m at one side, but this is not practical. To be more precise, the inner diameter (radius) of an orifice tube and the outer diameter (radius) of a rod can be calculated from an equation: $\pi a^2 - \pi b^2 < 0.5$ (where a is the inner diameter of the orifice tube and b is the outer diameter of the rod). In a case where the outer diameter of the rod is set to 10 mm, the inner diameter a of the orifice tube becomes a < 10. 00795 mm. Therefore, the space between the inner diameter a of the orifice tube and the outer diameter b of the rod becomes approximately 8μ m at one side from a – b.

The dispersing portion of Toda has the rod 10 fitted into the cylindrical hollow of the dispersing section body 1, is assembled as to be decomposable, and forms the annular gas passage 2. Therefore, it is necessary to hold the rod 10 at the center of the hollow portion. However, because it is difficult to hold the rod 10 at the center of the hollow

portion without an error, it is obvious that misalignment occurs in a radial direction, thus resulting in a difference in the space between the dispersing section body 1 and the rod 10. As the difference arises between the dispersing section body 1 and the rod 10, a carrier gas intensively flows from a portion where the space between the dispersing section body 1 and the rod 10 is large since the carrier gas is likely to flow from a portion having the smallest resistance. This causes un-uniformity of the carrier-gas flow amount in the annular gas passage 2.

Further, the difference in the resistances at the gas passage 2 is caused not only the difference of the space between the dispersing section body 1 and the rod 10, but also a raw-material solution supplied to the gas passage 2. Therefore, as the raw-material solution is supplied to the gas passage 2, the carrier gas is likely to flow through the gas passage 2 as to be away from the raw-material solution.

Therefore, because the dispersing portion of Toda cannot cause the carrier gas to uniformly flow through the annular gas passage 2, there is a problem such that the raw-material solution cannot be atomized.

Modified examples of a gas passage disclosed in FIGS. 7A, 7B, 9A, 9B, 9C, and 10 of Toda employ a structure such that a rod is fitted into the cylindrical hollow of a dispersing section body to be decomposable, a groove is formed on the surface of the rod to form a gas passage. Therefore, it is necessary to hold the rod at the center of the hollow. However, when the rod is fitted into the center of the cylindrical hollow of the dispersing section body, a space of 5 to 10 μ m is caused, so that a gas and a solution flows into the space over the groove, and the raw-material solution cannot be atomized.

In contrast, according to the present invention as set forth in claim 21, because "a carrier gas supplied from the carrier gas provided outwardly of the raw-material solution pipes in such a manner as to cover the raw-material solution pipes uniformly flows into the vaporizing tube via the orifice, is mixed with the raw-material solutions at the dispersing portion provided between the orifice and the leading ends of the raw-material

solution pipes, and is immediately sprayed from the orifice to the vaporizing tube at a fast speed", it is possible to cause the carrier gas to uniformly flow through the carrier gas pipe, the dispersing portion, and the orifice. Further, according to the invention as set forth in claim 21, because the dispersing portion provided between the orifice and the leading ends of the raw-material solution pipes mixes the carrier gas uniformly flowing with raw-material solutions, and immediately sprays the mixture to the vaporizing tube at a fast speed, it is possible to disperse the raw-material solutions into the carrier gas and to surely atomize the mixture. Such a structure which brings the unique effectiveness of the present invention as set forth in claim 21 is not disclosed or suggested in Toda.

The present invention as set forth in claim 21 overcomes the problem of Toda such that raw-material solutions cannot be dispersed into a carrier gas, and has a feature not disclosed or suggested in Toda that "a carrier gas supplied from the carrier gas provided outwardly of the raw-material solution pipes in such a manner as to cover the raw-material solution pipes uniformly flows into the vaporizing tube via the orifice, is mixed with the raw-material solutions at the dispersing portion provided between the orifice and the leading ends of the raw-material solution pipes, and is immediately sprayed from the orifice to the vaporizing tube at a fast speed". Therefore, it is strongly believed that the present invention is not obvious from Toda.

Further, the feature of the present invention is disclosed nowhere in Sun and Schmitt. Therefore, it is strongly believed that a person skilled in the art cannot achieve the present invention from Toda, Sun and Schmitt and the combination thereof.

The present invention as set forth in claim 21 has a vaporizer for CVD having a completely different structure from those of Toda, Sun, and Schmitt, such a difference ensures continuous usage, and such an effectiveness of the invention cannot be predicted from all cited references.

(4) As explained above, the superior effectiveness of the invention achieved based on the unique structure of the present invention as set forth in claim 21 is not

disclosed or suggested in Toda, Sun and Schmitt. Besides, Toda has a problem such that it cannot atomize a raw-material solution, but the present invention as set forth in claim 21 can overcome all of the foregoing problems. Therefore, it is difficult to reach the present invention as set forth in claim 21 from the combination of Toda, Sun and Schmitt.

Therefore, it is strongly believed that the present invention as set forth in claim 21 has non-obviousness with respect to Toda, Sun and Schmitt.

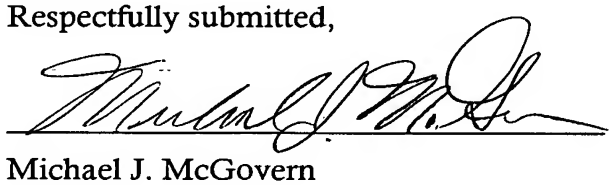
Claims 22 to 35 are dependent on claim 21, and further limit the structure of the present invention as set forth in claim 21 and are therefore allowable for at least the same reasons as claim 21.

CONCLUSION

No additional fees are believed to be due, however, in the event that any fee or credit is determined to be due, authorization is hereby given to charge deposit account no. 17-0055.

In view of the amendment and remarks, reconsideration of the application is respectfully requested. Claims 21-35 are now pending and a Notice of Allowance for these claims is earnestly solicited.

Respectfully submitted,

By: 

Michael J. McGovern
Quarles & Brady LLP
411 E. Wisconsin Avenue
Milwaukee, WI 53202-4497
(414) 277-5725
Attorney of Record